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ABSTRACT

Since the beginning of the decade, a significant number of states have initiated science and technology programs to encourage economic growth. Although these programs share some structural similarity, many of the specific details are unique. Among the unique aspects of these state programs are their objectives, organizational elements, relationships to universities, industry, and the federal government, the amount of state support and how it is distributed, and the type of research and/or development that is undertaken. In response to these assessment efforts and to specific requests from the states, the Government-University-Industry Research Roundtable, in association with the National Governors' Association and the National Research Council, held a workshop on April 10, 1987. This report brings together the main issues that arose during the workshop with additional information and ideas provided by the states regarding assessment procedures. The purpose is to provide information on the self-assessment process that will help state program officials determine appropriate measures and mechanisms for assessing their specific programs. (CW)

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State Government Strategies for Self-Assessment of Science and Technology Programs for Economic Development

A Report of a Workshop
April 10, 1987

GOVERNMENT-UNIVERSITY-INDUSTRY RESEARCH ROUNDTABLE

NATIONAL GOVERNORS' ASSOCIATION

NATIONAL RESEARCH COUNCIL

National Academy Press Washington, D.C. 1987

The Government-University-Industry Research Roundtable

The Government-University-Industry Research Roundtable is sponsored by the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. The Research Roundtable was created in 1984 to provide a forum where scientists, engineers, administrators, and policymakers from government, university, and industry can come together on an ongoing basis to explore ways to improve the productivity of the nation's research enterprise. The object is to try to understand issues, to inject imaginative thought into the system, and to provide a setting or discussion and the seeking of common ground. The Roundtable does not make recommendations, nor offer specific advice. It does develop options and bring all interested parties together. The uniqueness of the Roundtable is in the breadth of its membership and in the continuity with which it can address issues.

The Roundtable receives support from the National Research Council Fund, the Alfred P. Sloan Foundation, the Andrew W. Mellon Foundation, the Monsanto Company, and several federal R&D agencies including the Department of Energy, the National Institutes of Health, the National Science Foundation, and the U.S. Department of Agriculture. Funds for partial support of this specific project were provided by the Pennsylvania Ben Franklin Partnership Program.

The National Governors' Association

The National Governors' Association, founded in 1908, represents the Governors of the fifty states and the Commonwealth of Puerto Rico and the Northern Mariana Islands, the territories of the Virgin Islands, Guam, and American Samoa. Its missions are to influence the development of national policy and to apply creative leadership to state problems.

NGA membership is organized into seven standing committees in major substantive areas: Agriculture, Criminal Justice and Public Protection, Economic Development and Technological Innovation, Energy and Environment, Human Resources, International Trade and Foreign Relations, and Transportation, Commerce, and Communications. Special committees and task forces are formed in response to principal concerns of the Governors.

The National Research Council

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purpose of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine.

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INTRODUCTION

Since the beginning of the decade, a significant number of states have initiated science and technology programs to encourage economic growth. Although these programs share some structural similarity, many of the specific details are unique. Among the unique aspects of these state programs are their objectives, organizational elements, relationships to universities, industry, and the federal government, the amount of state support and how it is distributed, and the type of research and/or development that is undertaken.

State programs also differ in the extent of development, and in the degree to which assessment measures have been considered. All program officials from the state science and technology programs, however, are involved in implementing or in searching for reliable measures to assess how the programs are evolving.

In response to these assessment efforts and to specific requests from the states, the Government-University-Industry Research Roundtable, in association with the National Governors' Association and the National Research Council, held a workshop on April 10, 1987, entitled, "State Government Strategies for Self-Assessment of Science and Technology Programs for Economic Development." Thirty-six participants (see Appendix I) attended the workshop including state government representatives as well as university, industrial, and federal colleagues.

The workshop was organized to focus on research and development programs that involve universities and industry, and are supported at least in part by the state. (The several other types of state science and technology programs, for example, technology transfer, small business development, entrepreneurial assistance, venture capital, and education and training were not discussed in detail.) The discussion was organized to maximize the exchange of views and ideas that state program officials have about performing self-assessment and the issues involved. State officials are attempting to design appropriate assessment measures to help them address the two key questions: Is the program a worthwhile investment, considering all of the other demands for state money? Is the program structured most effectively? Within the scope of these larger issues are more specific questions that were discussed as part of the assessment process: Is the program strengthening the technology infrastructure? Has the program contributed to the improvement of university

research and education? Has the program contributed to advances in industrial products and processes? Are industry and university researchers cooperating in new ways? Has the program contributed to jobs being created, retained, or upgraded? Is economic growth resulting? Can economic development be attributed to or correlated with these programs? Is economic development a necessary accomplishment for these programs to be considered a success?

This report brings together the main issues that arose during the workshop with additional information and ideas provided by the states regarding assessment procedures. The purpose is to provide information on the self-assessment process that will help state program officials determine appropriate measures and mechanisms for assessing their specific programs.

COMMON ELEMENTS OF THE PROGRAMS

To provide a framework for the workshop deliberations, Richard Nelson, professor of International and Public Affairs at Columbia University and Vice Chairman of Roundtable Working Group Three (Appendix II), outlined common elements of the programs (see Appendix III). These common elements encompass both structural characteristics of the programs and their goals and objectives. The central themes of the discussion are presented below.

PROGRAMS ARE COOPERATIVE ENDEAVORS

The recipient of funds in all of the programs considered at the workshop works with a university in some manner. The emphasis at the workshop was on cooperative research and development programs involving university, government, and industry rather than on business development programs. Examples are: a university department, a university-associated research or technology development center, a principal investigator, a private non-profit corporation, and an independent research institution.

STATES PROVIDE FINANCIAL SUPPORT

At least part of the financial support to the university program comes from the state. Other sources such as industry, the federal government, and private foundations provide additional support. Procedures are built into the programs to leverage state funding, intended to maximize the impact of the state investment.

MANY CONSTITUENTS ARE INVOLVED IN THE PROGRAMS

State government, universities, business, and the federal government all participate in the state science and technology programs. The makeup of participating sectors varies among states and among programs within a state. Each of these constituents has different expectations for the program, and these varied goals are reflected in the programs. Universities are interested in obtaining financial support for research, as well as in educating students and attracting talented faculty, thus bolstering the education and research capacity of the region. The business community anticipates interacting with these students and faculty, and gaining insights into new areas of research and technology, and into techniques for improved processing and production. The federal government values these programs for their potential in enhancing the R&D infrastructure--particularly for fundamental research--and the nation's competitive advantage. And the state governments expect their science and technology programs ultimately to yield economic development within the state.

THE SCIENCE AND TECHNOLOGY PROGRAMS ARE LONG-TERM INITIATIVES

One critical element common to these science and technology programs is that they are thought of as long-term initiatives. Economic development is the key concern for the states. Participants at the workshop agreed that programs focused on research and development in conjunction with universities are not expected to yield significant economic growth for 5 to 10 years or longer, and even then the specific impact of the program on economic growth may be difficult to demonstrate. Given this time scale, all programs considered by the workshop are in the early stages. Any assessment process would have to take this fact into account--marked economic development is not likely to occur in the short run.

PROGRAMS HAVE BOTH PROXIMATE AND ULTIMATE GOALS

Although state programs all have economic development as their ultimate goal, state officials also seek accomplishments other than of an economic nature in the near-term. These near-term or proximate goals tend to focus on the operational objectives of the program in the areas of education, research, technology development, meeting the needs of industry, and financial support. State representatives view both near-term and ultimate goals as important for assessing the success of their programs, although at this stage of development of the programs, state program officials value the achievement of the proximate goals as being more helpful indicators of how the programs are faring.

Proximate Goals

Examples of the different proximate goals of the state programs include: strengthening graduate education and university research; creating "centers of research excellence" in selected areas of science and technology; changing university and industry culture to enhance university and industry collaborative relationships; producing new industrial processes and new commercial technologies; and improving the translation of knowledge and expertise within the university into commercial applications. These goals tend to be state-specific. The uniqueness of the near-term goals for each state reflects the varied nature of the programs and the differing views of the individual states about what elements of their science and technology enterprise need to be strengthened to assist in bringing about the ultimate goal of economic growth.

State officials perceive achievement of these proximate goals as indicative of movement toward economic development, although they recognize that the connection between these goals and economic impact are difficult to demonstrate unequivocally. Proximate goals also are often qualitative and difficult to measure.

The Ultimate Goal: Economic Development

The ultimate goal for all state science and technology programs is economic development. Officials hope eventually to see growth within the state in terms of the formation of new industries, retention and expansion of existing firms, creation of new jobs and retention of existing jobs, increased job training opportunities leading to a more qualified workforce, and an increase in state revenues.

ASSESSMENT ISSUES

State officials are wrestling with two large issues as they consider suitable assessment measures for their programs. The first concern is the extent to which officials feel they can correlate economic growth within the state to the impact of their specific programs either in the short-term or the long-term. The second issue is the fact that there are two different audiences within the state that judge how the program is doing: the officials running the programs and officials responsible for allocating resources--most prominently the state legislatures. The assessment process must account for these often quite different perspectives.

CAN THE PROGRAMS DEMONSTRATE THEIR CONTRIBUTION TO ECONOMIC DEVELOPMENT?

State officials acknowledge that it is difficult to judge the extent and the accuracy with which new economic development can be attributed to a specific research and development program. Suzanne Gilchrist-Thompson, Analyst for the Florida High Technology and Industrial Council, asked, "How are we going to determine if our program is responsible for students staying in Florida? How can we isolate the variable of our program as compared to 'Sun and Fun?' How can we know if an industry comes to Florida because of our program or because of the lending climate or the tax climate? Those are all variables that we really are trying to grapple with."

A cause and effect relationship between these programs and economic development cannot be ascertained directly because there is no experimental control to show what would have happened in the state if the program did not exist. The inability to distinguish the effects of state research and development programs from all else is a key issue as the states raise questions such as: Had the state put money into a different program, would others have provided support for university programs? Would different investment of state funds have yielded more economic development? How should the legislature consider funding science and technology programs in relation to funding other priorities? State officials recognize that, for R&D programs, these questions only can be addressed, if at all, over the long run by assessing what beneficial changes have occurred in the state where the program may have made a contribution. Therefore, the states are wrestling with how to best incorporate this perspective of their programs' economic impacts in their assessment procedures, in their program descriptions, and in their requests for continued state support.

ASSESSMENT FOR TWO STATE AUDIENCES

The two primary parties within the state that are interested in assessing program effectiveness are the officials that fund the programs and the officials that administer them. Both audiences are looking for signs of success in the programs, but, in the experience of the workshop participants, the two parties value different assessment criteria. Edward Cohen, Executive Director of New Jersey's Commission on Science and Technology, defined the situation: "We have to...convince those people on whom we depend for the continued support of our programs.... We must also convince ourselves."

Assessment for the Officials that Allocate Resources

Workshop participants suspect that assessment based on proximate goals will not satisfy the needs of the state legislatures and other officials responsible for allocating resources for very long. To some degree, if the university and business communities are happy with the program, the legislature will be supportive. However, the current situation, as described by workshop participants, is that state legislators like to see assessment based on quantitative measures of economic development such as: the numbers of new jobs the program has created in the state, the number of start-up firms helped by the program, and the number of new patents it has generated. They want to see data proving the value of the programs they are supporting, and how these programs are enhancing economic development within the state--even in the short-term. And in both the short- and long-term, legislatures are looking for quantitative measures to which they can refer to justify funding these programs.

Many state officials at the workshop indicated that they are not comfortable with their ability to generate with any accuracy the type of data their legislatures seek. State officials, however, recognize the forces that drive legislators to seek these data. Suzanne Gilchrist-Thompson described the quandary for funding priorities in Florida. Legislators must be able to justify "why funds are going to...academics, when we are releasing prisoners from our jails because we don't have enough jail space, when people are clamoring for pay increases and for improved education of their children, and when Florida spends one of the lowest per capita amounts on social services of any state in the nation."

Assessment for the Program Officials

Given the difficulty of identifying milestones in the short-term that provide clear evidence of the impact of their R&D programs on economic growth, most state program officials stress that, at this stage of development of the programs, it is more significant to assess how well the program is achieving its proximate goals. Richard Nelson stated the general feeling at the workshop when he spoke of the pressure between keeping the assessment focused on near-term proximate goals vs. "jumping into the water and trying to hazard an evaluation...in terms of actual effects on economic development." As Richard Geltman, Staff Director of the National Governors' Association's Committee on Economic Development and Technological Innovation pointed out, "At this point,

measuring by outcome is very difficult; may not be possible; or may be unfair," indicating the need for proximate measures as well as looking for economic development in the long-term.

Program officials want to understand how each component of their programs (e.g., research, education, technology commercialization) is operating so that they can continue to monitor progress and make any modifications necessary to achieve the desired expectations. As Megan Jones, Director of the Centers of Excellence Corporation of Massachusetts, put it, "Indications of success are crucial to continued support...but equally important are assessments to help guide the development and evaluation of our program."

John Straus from Illinois explained that, "the nature of technology and the nature of technology development do not give us the ability to generate [ultimate] results in the short and near midterm." Proximate measures are viewed by the state officials as providing information in the short-term that is valuable for assessing how the program is evolving.

Despite their reservations about providing ultimate measures to their legislatures, the state program officials recognize the legislatures' needs and provide them with whatever information possible so that the programs will continue to get state funding. Edward Cohen described presenting job creation figures as a measure of economic impact of R&D programs as doing "a dance of the veils in front of the legislature." He expressed the view shared by others at the workshop that the numbers only have value if both the program officials and the legislature approach the figures with a realistic understanding of their limitations. The state program officials face the challenge of convincing state legislators to be more responsive at this stage to progress toward the proximate goals as indicators of success and as justification for continued state support.

VARIETY OF APPROACHES TO ASSESSMENT

States are considering the use of different proximate assessment measures based on their individual program objectives. Proximate measures highlighted during the workshop are described below. Pennsylvania uses some of these approaches, but also collects data to estimate the contribution of its Ben Franklin Partnership Program to economic growth. A discussion of these measures for ultimate results also is included here as another approach to assessment.

THE PROGRAM STRUCTURE

One useful mechanism for assessment, given that program outcomes may not exist or may be difficult to assess in the short-term, is to focus on the process of establishing the structure of the program. Rather than measuring program effects, states can determine the degree to which the program is developing according to the state's original plans. Many state program officials seem comfortable with this type of assessment, particularly during the early years of the program. Indeed, workshop participants applauded this type of assessment in that it provides assurances that the program has been established according to the original intent, or has been modified for specific reasons. Such analysis will be beneficial to program officials in keeping their programs on a productive course.

Officials of the Florida High Technology and Industry Council, for example, recently presented their senators with data to show that the first step, setting up the program, is complete, and that the program is organized as originally envisioned. The data described the technical and geographical distribution of the project reviewers, and the state-wide distribution of research funds. Florida used these measures to illustrate the quality and breadth of the review process and the widespread implementation of the program.

James Kenworthy, Director of Program Development for Michigan's Strategic Fund, described an assessment procedure that measures one aspect of a program's structure. Sources of support exist along the continuum from basic to applied research. Funding for basic research tends to come from federal sources, and support for research with more immediate commercial value tends to be supplied by industry. Therefore, by assessing the makeup of support obtained to match state dollars, state officials can ascertain the range of research underway within a specific program, and compare this range with their original expectations.

Presumably, program officials have expectations concerning the types of research that a specific program should undertake. The degree to which the types of organizations that match state dollars reflect this expectation illustrates the extent to which the program mission is being carried out.

Donald Beilman, President of the Microelectronics Center of North Carolina, offered the opinion that funds from the NSF and NIH tend to go to older institutions with established reputations. Because he feels that the amount of their support is affected in part by this consideration, he is not comfortable using this measure as an indication of the basic research performed.

Two additional measures of program structure outlined by Kenworthy are the composition of clientele and the types of services offered by the program. He

suggested that if the original intent of the program clearly identifies which industries it wishes to serve, what size and type of businesses it wishes to assist (small start-up companies, small to mid-sized manufacturing firms, etc.) and what services it wants to provide, then assessing how well the program's expectations in these areas are being met will be a helpful measure in determining how closely the development of the program has followed its original plans.

For example, involvement of small companies is a proximate goal for a number of the state science and technology programs, and one that seems difficult for many states to meet. Some state programs provide incentives to encourage participation of small entrepreneurial firms. The Arkansas Science and Technology Authority's Applied Research Program provides a larger percentage of funding to a grant applicant if the private source of matching funds is an Arkansas industry with less than 50 employees. A review of the composition of clients and the sources of matching funds shows to what degree this goal is being achieved.

THE UNIVERSITY INFRASTRUCTURE

Many state officials recognize that the strength of its universities will dictate the success of their programs over the long run. The quality of university research and education programs is viewed as a critical component for promoting technology development and innovation in the state. Measures used to assess this goal are often subjective and qualitative and include the volume and nature of the financial support for university research, the quality of faculty and students, and the characteristics of new university research programs (e.g. Are they multidisciplinary? Do they involve industry?).

As a caveat to measuring progress to this goal, it is important to note that there are lots of influences on a university. Richard Nelson pointed out that the state science and technology funds are just a "drop in the bucket" of funds going into the university so that the effect of the state programs is difficult to separate from all else and measure in its own right.

MATCHING FUNDS

Many state officials measure the ratio of state to industry support as an indicator of how the program is meeting the needs of industry. They view the degree of industry involvement as a vote of confidence in the program's value. A recent letter from the Florida High Technology and Industry Council to a Florida senator states, "The nearly dollar for dollar contribution of private money to state money shows that the desired relationships were established, and top quality programs were recognized."

The Michigan Strategic Fund supplies seed capital to start centers only if the project can attract a two-to-one match of state dollars. The size of a future award in Florida, Pennsylvania, and New York is determined in part by the ratio of state funds to matching funds the project was able to attract.

THE VIEWS OF PROGRAM PARTICIPANTS

The views of the persons receiving support from the state programs are a measure of the achievement of proximate objectives. New York, New Jersey, and Massachusetts, for example, require periodic reports from the program participants that respond to questions about program activities. These states ask questions such as: "Do the industrial contributors participate in planning and project selection of the Center? Are they satisfied with the direction and results of the Center's programs?" "What is done to foster multidisciplinary research in your Center?" "Please describe and analyze the way in which the partnership between the academic institution and the private sector institution worked. Please include any plans for continued cooperation."

In New York, as in other states, site visits are used to obtain more in-depth information about participants' views and program operation. A team of experts from a variety of fields visits the Centers for Advanced Technology, talks to the researchers there, observes the work in progress, and then reports to the legislature. Vernon Ozarow of the New York Science and Technology Foundation reported that the legislature listens to the report from this team with the expectation that the team will recognize quality. At this stage of program development, questionnaires and site visits provide qualitative information about the progress and vitality of the programs, not hard data about economic development.

CULTURAL CHANGE IN INDUSTRY AND UNIVERSITIES

Virtually all of the state programs emphasize cooperation between university and industry. The hope is that these programs will stimulate and nurture creative research endeavors that will have commercial promise. Roger Tellefsen, former Executive Director of Pennsylvania's Ben Franklin Partnership Program, says that the "...interesting program issues are really the changing cultural situation between universities and companies, and finding out on an individual basis how the participation with a state program like the Ben Franklin Program has changed researcher's perceptions of what a company can do for a researcher at a university, and how participation with a university has changed the company's perception of how research can affect production line

issues." Some mechanisms of the programs encourage research actively involving both industry and university personnel and equipment. Others encourage university researchers to carry out basic research for industry, to do contract work for clientele from industry, or to provide industry with technical assistance.

Assessment of university-industry relations can be accomplished using indicators such as the number of joint (university-industry) research projects, the number of university sabbaticals to companies and the number of industry sabbaticals to university labs, changes in university promotion policies, the number of joint publications and patent applications, the degree to which equipment and facilities are shared, the extent of informal interactions between university and industry personnel in seminars, workshops, and problem-solving sessions, and the extent of industrial financial support for university programs.

However, Stephen Rattien of the National Research Council, said that while states can measure the changing university-industry relationships on a "product-by-product or project-by-project basis," probably more realistically the program should aim to get university and industry colleagues "thinking about one another and looking at each other and talking...in areas where [they previously] had nothing to do with each other...that is probably where the greatest benefit is going to be." The problem, Rattien felt, is in communicating this sort of product to the legislators. He continued, "How to get that across to the people who pay your way is a tough story."

QUANTITATIVE DATA AND ESTIMATES FOR THE ULTIMATE GOAL OF ECONOMIC DEVELOPMENT

In response to the desires of their legislatures, many states are struggling with creating mechanisms and measurements that will provide data they feel are accurate and representative of how their program contributes to economic development. Pennsylvania uses such quantitative measurements and estimates in its assessment process more than other states, and, therefore, much of the discussion focused on its procedures. In addition to applied R&D programs, Pennsylvania's Ben Franklin Partnership Program includes components focused on entrepreneurial development, product development, new business start-ups, and small business assistance. It is these components, aimed directly at economic development in the near-term, that provide the basis for much of the quantitative estimates. For assessing the progress of the longer-term R&D programs, Pennsylvania, as well as most other states, consider proximate and qualitative measures to be more appropriate.

Among the numbers that officials from Pennsylvania have been collecting are: the number of new jobs that the program has assisted in creating, the number of relocated firms where the program played a significant role, (a distinct category to avoid duplication), the number of start-up firms established, and the amount of venture capital attracted to firms related to the program's Centers. For each of these estimates the program provides explicit definitions and details for results that can and cannot be used as part of the assessment data. These numbers are released, along with relevant qualitative information and proximate measures, to the public quarterly as announcements of the program's progress and success.

Representatives of Pennsylvania are confident that the numbers they collect concerning economic development accurately reflect the success of the program. Walter Plosila, President of the Montgomery County High Technology Council, and previously Deputy Secretary for Technology and Policy Development of Pennsylvania's Department of Commerce, attributes Pennsylvania's faith in their economic development measures to the fact that the formulae and assessment methodology were put in place from the outset of the program, and the formulae used are quite specific.

In spite of the fact that most state representatives recognize the need to provide data to their legislatures, they are not confident in their ability to generate accurate quantitative data and estimates that indicate impacts of long-term R&D programs on economic development. John Straus described the concern in Illinois, saying that program officials there do not want to "paint themselves into a corner as job-creation agents." The programs are expected to accomplish some near-term goals before achieving economic development, and the workshop participants stressed that they want the legislatures to view these proximate goals in judging the merits of a program as well as looking for specific economic development outcomes.

PARTING WORDS

SET REASONABLE GOALS

State representatives cautioned each other not to make claims or promises to their legislatures concerning the outcomes of their programs that they will not be able to meet. If the promises are not fulfilled in the short- or long-term, the programs will be regarded as failures. In assessing their programs, state officials want to convince their legislature of what they believe: that the research and development program will strengthen the state's

economy in the long-term. At the same time, they want to avoid raising expectations beyond what the program can realistically achieve.

ESTABLISH ASSESSMENT PLANS AT THE OUTSET OF THE PROGRAM

Workshop participants suggested that it is easier to assess programs if the goals and the criteria for short- and long-term assessment are articulated early on in establishing the program, with the mission of the program in mind. James Kenworthy and Walter Plosila both stressed this point: assessment is simplified if the goals and purposes of the programs are clearly defined at the outset.

PROGRAMS ARE VALUABLE

The atmosphere at the workshop was one of optimistic determination. With focus on the proximate goals of the R&D programs, program officials feel there are measures in the short-term to demonstrate program effectiveness to themselves and to their legislatures. They also see the programs as valuable to the states' economic development efforts in the long-term. A degree of faith is required, however, to connect the achievement of proximate goals in these R&D programs to long-term economic benefits to the state.

To some degree, workshop participants feel that the relative success of the programs makes their progress more difficult to assess because the assessment must primarily measure degrees of success and efficiency, rather than focusing on negative aspects. James Kenworthy expressed the general opinion, saying, "I think we can recognize a failure. I am not sure we know how yet to define success."

Despite their concerns regarding reliable assessment measures, state officials believe in the value of their programs. John Straus expressed the general feeling, saying, "We cannot say with any certainty that what we do makes a difference [to economic growth]. We believe philosophically that it does. We believe that by creating infrastructure...we contribute to economic development and technology development."

NEXT STEPS

At the close of the workshop, topics were raised for possible future discussions concerning the state science and technology programs. These ideas are outlined below.

- Explore appropriate assessment methodologies and criteria for judging the effectiveness of the state science and technology program(s). Provide assistance to help states develop more generic assessment measures.
- Follow legislative and other developments for setting up a clearinghouse for state and federal programs in science and technology.
- Articulate federal and state policies for science and technology programs and pursue a dialogue for cooperation. Bring together federal and state policymakers and decisionmakers to better clarify objectives and to consider possible approaches to more effective collaboration in science and technology.

The National Governors' Association, the National Research Council, and the Research Roundtable are working together to address these topics in an effort to continue discussions and activities of concern to all relevant parties in the development of alliances in science and technology.

WORKSHOP ON STATE GOVERNMENT STRATEGIES FOR SELF-ASSESSMENT OF SCIENCE AND TECHNOLOGY PROGRAMS FOR ECONOMIC DEVELOPMENT
April 10, 1987

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Director
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GOVERNMENT-UNIVERSITY-INDUSTRY RESEARCH ROUNDTABLE
WORKING GROUP THREE
"NEW ALLIANCES AND PARTNERSHIPS: ENHANCING THE UTILIZATION OF SCIENTIFIC ADVANCES"

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COMMON ELEMENTS OF STATE GOVERNMENT PROGRAMS IN SCIENCE AND TECHNOLOGY FOR ECONOMIC DEVELOPMENT